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<110> Covacci, Antonello
Bugnoli, Massimo
Telford, John
Macchia, Giovanni
Rappuoli, Rino

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Gln Lys Ala Thr Leu Arg Leu Gly Gln Phe Asn Gly Asn Ser Phe Thr
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Ser Tyr Lys Asp Ser Ala Asp Arg Thr Thr Arg Val Asp Phe Asn Ala
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cattcttcgc ttcaaaacgc tttcataaat ctctctaaag cgctttataa tcaacacaat 4980
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gctcgcatga aattccactt tagggaatgc gtgtgcattt tttttaaggc cgtatttttg 5160
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tgcgaaacat tcaaatagcc ttgttgtttc agggcattgt cataagcgtt ggattggatc 5460
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gctaaaatgc ttggctcaat cacgcccaca atagggattt tggaatgctt ttgcatctct 5580
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E17

taaggcactc tagccgtatc gccataatag atgatttcac caaataattg cgctttttaa 5760
 aggccttttta aaacgctaaa cctcccccaca ccgctatcaa aaacgcctat tttcatgaca 5820
 ctttttttaat ttaatgggat taattaggga ttttattttt cattcattaa gtttaaaaaat 5880
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 <211> 1147
 <212> PRT
 <213> Helicobacter pylori
 <400> 5

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Asn Pro Gln Gln Phe Ile Asn Asn Leu Gln Val Ala Phe Leu Lys Val
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Asp Asn Ala Val Ala Ser Tyr Asp Pro Asp Gln Lys Pro Ile Val Asp
 35 40 45

Lys Asn Asp Arg Asp Asn Arg Gln Ala Phe Glu Gly Ile Ser Gln Leu
 50 55 60

Arg Glu Glu Tyr Ser Asn Lys Ala Ile Lys Asn Pro Thr Lys Lys Asn
 65 70 75 80

Gln Tyr Phe Ser Asp Phe Ile Asn Lys Ser Asn Asp Leu Ile Asn Lys
 85 90 95

Asp Asn Leu Ile Asp Val Glu Ser Ser Thr Lys Ser Phe Gln Lys Phe
 100 105 110

Gly Asp Gln Arg Tyr Arg Ile Phe Thr Ser Trp Val Ser His Gln Asn
 115 120 125

Asp Pro Ser Lys Ile Asn Thr Arg Ser Ile Arg Asn Phe Met Glu Asn
 130 135 140

Ile Ile Gln Pro Pro Ile Leu Asp Asp Lys Glu Lys Ala Glu Phe Leu
 145 150 155 160

Lys Ser Ala Lys Gln Ser Phe Ala Gly Ile Ile Ile Gly Asn Gln Ile
 165 170 175

Arg Thr Asp Gln Lys Phe Met Gly Val Phe Asp Glu Ser Leu Lys Glu
 180 185 190

Arg Gln Glu Ala Glu Lys Asn Gly Glu Pro Thr Gly Gly Asp Trp Leu
 195 200 205

Asp Ile Phe Leu Ser Phe Ile Phe Asp Lys Lys Gln Ser Ser Asp Val
 210 215 220

Lys Glu Ala Ile Asn Gln Glu Pro Val Pro His Val Gln Pro Asp Ile
225 230 235 240

Ala Thr Thr Thr Thr Asp Ile Gln Gly Leu Pro Pro Glu Ala Arg Asp
245 250 255

Leu Leu Asp Glu Arg Gly Asn Phe Ser Lys Phe Thr Leu Gly Asp Met
260 265 270

Glu Met Leu Asp Val Glu Gly Val Ala Asp Ile Asp Pro Asn Tyr Lys
275 280 285

Phe Asn Gln Leu Leu Ile His Asn Asn Ala Leu Ser Ser Val Leu Met
290 295 300

Gly Ser His Asn Gly Ile Glu Pro Glu Lys Val Ser Leu Leu Tyr Gly
305 310 315 320

Gly Asn Gly Gly Pro Gly Ala Arg His Asp Trp Asn Ala Thr Val Gly
325 330 335

Tyr Lys Asp Gln Gln Gly Asn Asn Val Ala Thr Ile Ile Asn Val His
340 345 350

Met Lys Asn Gly Ser Gly Leu Val Ile Ala Gly Gly Glu Lys Gly Ile
355 360 365

Asn Asn Pro Ser Phe Tyr Leu Tyr Lys Glu Asp Gln Leu Thr Gly Ser
370 375 380

Gln Arg Ala Leu Ser Gln Glu Glu Ile Gln Asn Lys Ile Asp Phe Met
385 390 395 400

Glu Phe Leu Ala Gln Asn Asn Ala Lys Leu Asp Asn Leu Ser Glu Lys
405 410 415

Glu Lys Glu Lys Phe Arg Thr Glu Ile Lys Asp Phe Gln Lys Asp Ser
420 425 430

Lys Ala Tyr Leu Asp Ala Leu Gly Asn Asp Arg Ile Ala Phe Val Ser
435 440 445

Lys Lys Asp Thr Lys His Ser Ala Leu Ile Thr Glu Phe Gly Asn Gly
450 455 460

Asp Leu Ser Tyr Thr Leu Lys Asp Tyr Gly Lys Lys Ala Asp Lys Ala
465 470 475 480

Leu Asp Arg Glu Lys Asn Val Thr Leu Gln Gly Ser Leu Lys His Asp
485 490 495

Gly Val Met Phe Val Asp Tyr Ser Asn Phe Lys Tyr Thr Asn Ala Ser

500

505

510

Lys Asn Pro Asn Lys Gly Val Gly Val Thr Asn Gly Val Ser His Leu
515 520 525

Glu Val Gly Phe Asn Lys Val Ala Ile Phe Asn Leu Pro Asp Leu Asn
530 535 540

Asn Leu Ala Ile Thr Ser Phe Val Arg Arg Asn Leu Glu Asp Lys Leu
545 550 555 560

Thr Thr Lys Gly Leu Ser Pro Gln Glu Ala Asn Lys Leu Ile Lys Asp
565 570 575

Phe Leu Ser Ser Asn Lys Glu Leu Val Gly Lys Thr Leu Asn Phe Asn
580 585 590

Lys Ala Val Ala Asp Ala Lys Asn Thr Gly Asn Tyr Asp Glu Val Lys
595 600 605

Lys Ala Gln Lys Asp Leu Glu Lys Ser Leu Arg Lys Arg Glu His Leu
610 615 620

Glu Lys Glu Val Glu Lys Lys Leu Glu Ser Lys Ser Gly Asn Lys Asn
625 630 635 640

Lys Met Glu Ala Lys Ala Gln Ala Asn Ser Gln Lys Asp Glu Ile Phe
645 650 655

Ala Leu Ile Asn Lys Glu Ala Asn Arg Asp Ala Arg Ala Ile Ala Tyr
660 665 670

Ala Gln Asn Leu Lys Gly Ile Lys Arg Glu Leu Ser Asp Lys Leu Glu
675 680 685

Asn Val Asn Lys Asn Leu Lys Asp Phe Asp Lys Ser Phe Asp Glu Phe
690 695 700

Lys Asn Gly Lys Asn Lys Asp Phe Ser Lys Ala Glu Glu Thr Leu Lys
705 710 715 720

Ala Leu Lys Gly Ser Val Lys Asp Leu Gly Ile Asn Pro Glu Trp Ile
725 730 735

Ser Lys Val Glu Asn Leu Asn Ala Ala Leu Asn Glu Phe Lys Asn Gly
740 745 750

Lys Asn Lys Asp Phe Ser Lys Val Thr Gln Ala Lys Ser Asp Leu Glu
755 760 765

Asn Ser Val Lys Asp Val Ile Ile Asn Gln Lys Val Thr Asp Lys Val
770 775 780

Asp Asn Leu Asn Gln Ala Val Ser Val Ala Lys Ala Thr Gly Asp Phe
785 790 795 800

Ser Arg Val Glu Gln Ala Leu Ala Asp Leu Lys Asn Phe Ser Lys Glu
805 810 815

Gln Leu Ala Gln Gln Ala Gln Lys Asn Glu Ser Leu Asn Ala Arg Lys
820 825 830

Lys Ser Glu Ile Tyr Gln Ser Val Lys Asn Gly Val Asn Gly Thr Leu
835 840 845

Val Gly Asn Gly Leu Ser Gln Ala Glu Ala Thr Thr Leu Ser Lys Asn
850 855 860

Phe Ser Asp Ile Lys Lys Glu Leu Asn Ala Lys Leu Gly Asn Phe Asn
865 870 875 880

Asn Asn Asn Asn Asn Gly Leu Lys Asn Glu Pro Ile Tyr Ala Lys Val
885 890 895

Asn Lys Lys Lys Ala Gly Gln Ala Ala Ser Leu Glu Glu Pro Ile Tyr
900 905 910

E17 Ala Gln Val Ala Lys Lys Val Asn Ala Lys Ile Asp Arg Leu Asn Gln
915 920 925

Ile Ala Ser Gly Leu Gly Val Val Gly Gln Ala Ala Gly Phe Pro Leu
930 935 940

Lys Arg His Asp Lys Val Asp Asp Leu Ser Lys Val Gly Leu Ser Arg
945 950 955 960

Asn Gln Glu Leu Ala Gln Lys Ile Asp Asn Leu Asn Gln Ala Val Ser
965 970 975

Glu Ala Lys Ala Gly Phe Phe Gly Asn Leu Glu Gln Thr Ile Asp Lys
980 985 990

Leu Lys Asp Ser Thr Lys His Asn Pro Met Asn Leu Trp Val Glu Ser
995 1000 1005

Ala Lys Lys Val Pro Ala Ser Leu Ser Ala Lys Leu Asp Asn Tyr
1010 1015 1020

Ala Thr Asn Ser His Ile Arg Ile Asn Ser Asn Ile Lys Asn Gly
1025 1030 1035

Ala Ile Asn Glu Lys Ala Thr Gly Met Leu Thr Gln Lys Asn Pro
1040 1045 1050

Glu Trp Leu Lys Leu Val Asn Asp Lys Ile Val Ala His Asn Val
1055 1060 1065

Gly Ser Val Pro Leu Ser Glu Tyr Asp Lys Ile Gly Phe Asn Gln
1070 1075 1080

Lys Asn Met Lys Asp Tyr Ser Asp Ser Phe Lys Phe Ser Thr Lys
1085 1090 1095

Leu Asn Asn Ala Val Lys Asp Thr Asn Ser Gly Phe Thr Gln Phe
1100 1105 1110

Leu Thr Asn Ala Phe Ser Thr Ala Ser Tyr Tyr Cys Leu Ala Arg
1115 1120 1125

Glu Asn Ala Glu His Gly Ile Lys Asn Val Asn Thr Lys Gly Gly
1130 1135 1140

Phe Gln Lys Ser
1145

<210> 6
<211> 546
<212> PRT
<213> Helicobacter pylori

<400> 6

E17 Met Ala Lys Glu Ile Lys Phe Ser Asp Ser Ala Arg Asn Leu Leu Phe
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Glu Gly Val Arg Gln Leu His Asp Ala Val Lys Val Thr Met Gly Pro
20 25 30

Arg Gly Arg Asn Val Leu Ile Gln Lys Ser Tyr Gly Ala Pro Ser Ile
35 40 45

Thr Lys Asp Gly Val Ser Val Ala Lys Glu Ile Glu Leu Ser Cys Pro
50 55 60

Val Ala Asn Met Gly Ala Gln Leu Val Lys Glu Val Ala Ser Lys Thr
65 70 75 80

Ala Asp Ala Ala Gly Asp Gly Thr Thr Thr Ala Thr Val Leu Ala Tyr
85 90 95

Ser Ile Phe Lys Glu Gly Leu Arg Asn Ile Thr Ala Gly Ala Asn Pro
100 105 110

Ile Glu Val Lys Arg Gly Met Asp Lys Ala Ala Glu Ala Ile Ile Asn
115 120 125

Glu Leu Lys Lys Ala Ser Lys Lys Val Gly Gly Lys Glu Glu Ile Thr
130 135 140

Gln Val Ala Thr Ile Ser Ala Asn Ser Asp His Asn Ile Gly Lys Leu
145 150 155 160

Ile Ala Asp Ala Met Glu Lys Val Gly Lys Asp Gly Val Ile Thr Val
165 170 175

Glu Glu Ala Lys Gly Ile Glu Asp Glu Leu Asp Val Val Glu Gly Met
180 185 190

Gln Phe Asp Arg Gly Tyr Leu Ser Pro Tyr Phe Val Thr Asn Ala Glu
195 200 205

Lys Met Thr Ala Gln Leu Asp Asn Ala Tyr Ile Leu Leu Thr Asp Lys
210 215 220

Lys Ile Ser Ser Met Lys Asp Ile Leu Pro Leu Leu Glu Lys Thr Met
225 230 235 240

Lys Glu Gly Lys Pro Leu Leu Ile Ile Ala Glu Asp Ile Glu Gly Glu
245 250 255

Ala Leu Thr Thr Leu Val Val Asn Lys Leu Arg Gly Val Leu Asn Ile
260 265 270

Ala Ala Val Lys Ala Pro Gly Phe Gly Asp Arg Arg Lys Glu Met Leu
275 280 285

E17 Lys Asp Ile Ala Ile Leu Thr Gly Gly Gln Val Ile Ser Glu Glu Leu
290 295 300

Gly Leu Ser Leu Glu Asn Ala Glu Val Glu Phe Leu Gly Lys Ala Gly
305 310 315 320

Arg Ile Val Ile Asp Lys Asp Asn Thr Thr Ile Val Asp Gly Lys Gly
325 330 335

His Ser Asp Asp Val Lys Asp Arg Val Ala Gln Ile Lys Thr Gln Ile
340 345 350

Ala Ser Thr Thr Ser Asp Tyr Asp Lys Glu Lys Leu Gln Glu Arg Leu
355 360 365

Ala Lys Leu Ser Gly Gly Val Ala Val Ile Lys Val Gly Ala Ala Ser
370 375 380

Glu Val Glu Met Lys Glu Lys Lys Asp Arg Val Asp Asp Ala Leu Ser
385 390 395 400

Ala Thr Lys Ala Ala Val Glu Glu Gly Ile Val Ile Gly Gly Gly Ala
405 410 415

Ala Leu Ile Arg Ala Ala Gln Lys Val His Leu Asn Leu His Asp Asp
420 425 430

Glu Lys Val Gly Tyr Glu Ile Ile Met Arg Ala Ile Lys Ala Pro Leu
435 440 445

Ala Gln Ile Ala Ile Asn Ala Gly Tyr Asp Gly Gly Val Val Val Asn
450 455 460

Glu Val Glu Lys His Glu Gly His Phe Gly Phe Asn Ala Ser Asn Gly
465 470 475 480

Lys Tyr Val Asp Met Phe Lys Glu Gly Ile Ile Asp Pro Leu Lys Val
485 490 495

Glu Arg Ile Ala Leu Gln Asn Ala Val Ser Val Ser Ser Leu Leu Leu
500 505 510

Thr Thr Glu Ala Thr Val His Glu Ile Lys Glu Glu Lys Ala Thr Pro
515 520 525

Ala Met Pro Asp Met Gly Gly Met Gly Gly Met Gly Gly Met Gly Gly
530 535 540

Met Met
545

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<211> 1838
<212> DNA
<213> Helicobacter pylori

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ctccatgacg ctgtcaaagt aaccatgggg ccaagaggca ggaatgtatt gatccaaaaa 180
agctatggcg ctccaagcat caccaaagac ggcgtgagcg tggctaaaga gattgaatta 240
agttgcccg tagctaacat gggcgctcaa ctcgttaaag aagtagcgag caaaaccgct 300
gatgctgccg gcgatggcac gaccacagcg accgtgctag cttatagcat ttttaaagaa 360
ggtttgagga atatcacggc tggggctaac cctattgaag tgaaacgagg catggataaa 420
gctgctgaag cgatcattaa tgagcttaaa aaagcgagca aaaaagtagg cggtaaagaa 480
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gctgacgcta tggaaaaagt gggtaaagac ggcgtgatca cgttgagga agctaagggc 600
attgaagatg aattggatgt cgtagaaggc atgcaatttg atagaggcta cctctcccct 660
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gacagaagaa aagaaatgct caaagacatc gctattttaa cggcggtca agtcattagc 960
gaagaattgg gcttgagtct agaaaacgct gaagtggagt ttttaggcaa agctggaagg 1020
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aaagacagag tcgcgagat caaaacccaa attgcaagta cgacaagcga ttatgacaaa 1140
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 gctgcgagtg aagtggaaat gaaagagaaa aaagaccggg tggatgacgc gttgagcgcg 1260
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 gctcaaaaag tgcatttgaa tttgcacgat gatgaaaaag tgggctatga aatcatcatg 1380
 cgcgccatta aagccccatt agtcaaatc gctatcaacg ctggttatga tggcgggtgtg 1440
 gtcgtgaatg aagtagaaaa acacgaaggg ctttttggtt ttaacgctag caatggcaag 1500
 tatgtggata tgtttaaaga aggcattatt gacccttaa aagtagaaag gatcgctcta 1560
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 aaagaagaaa aagcgactcc ggcaatgcct gatatgggtg gcatgggcgg tatgggagcg 1680
 atgggcggca tgatgtaagc ccgcttgctt tttagtataa tctgctttta aaatcccttc 1740
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 cttgtaaaaa catgcaacaa aaaatctctg ttaagctt 1838

<210> 8
 <211> 18
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> primer oligonucleotide

<400> 8
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<210> 9
 <211> 12
 <212> PRT
 <213> Helicobacter pylori

<400> 9
 Glu Phe Lys Asn Gly Lys Asn Lys Asp Phe Ser Lys
 1 5 10

<210> 10
 <211> 5
 <212> PRT
 <213> Helicobacter pylori

<400> 10
 Glu Pro Ile Tyr Ala
 1 5

<210> 11
 <211> 102
 <212> DNA
 <213> Helicobacter pylori

<400> 11
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 ccctttgaaa ggcatgataa agttgatgat cttagtaagg ta 102

<210> 12
<211> 34
<212> PRT
<213> Helicobacter pylori

<400> 12

Gly Arg Ser Val Ser Pro Glu Pro Ile Tyr Ala Thr Ile Asp Asp Leu
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Gly Gly Pro Phe Pro Leu Lys Arg His Asp Lys Val Asp Asp Leu Ser
20 25 30

Lys Val

<210> 13
<211> 18
<212> DNA
<213> Helicobacter pylori

<400> 13
cctgaaccga tttatgct

18

<210> 14
<211> 6
<212> PRT
<213> Helicobacter pylori

<400> 14

Pro Glu Pro Ile Tyr Ala
1 5

<210> 15
<211> 9
<212> DNA
<213> Helicobacter pylori

<400> 15
gatgatctc

9

<210> 16
<211> 3
<212> PRT
<213> Helicobacter pylori

<400> 16

Asp Asp Leu
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<210> 17
<211> 15
<212> PRT
<213> Helicobacter pylori

<400> 17

Phe Pro Leu Lys Arg His Asp Lys Val Asp Asp Leu Ser Lys Val
1 5 10 15

<210> 18
<211> 45
<212> DNA
<213> Helicobacter pylori

<400> 18
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<210> 19
<211> 36
<212> DNA
<213> Helicobacter pylori

<400> 19
gaattcaaaa atggcaaaaa taaggatttc agcaag 36

<210> 20
<211> 15
<212> DNA
<213> Helicobacter pylori

<400> 20
gaacccattt atgct 15

<210> 21
<211> 15
<212> DNA
<213> Helicobacter pylori

<400> 21
gaacccattt acgct 15

E17

<210> 22
<211> 45
<212> DNA
<213> Helicobacter pylori

<400> 22
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<210> 23
<211> 6
<212> PRT
<213> Helicobacter pylori

<400> 23

Asn Asn Asn Asn Asn Asn
1 5

<210> 24
<211> 18
<212> DNA
<213> Helicobacter pylori

<400> 24
aataacaata acaataat 18